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THICK WING FOR PROPULSION OR LIFT AND DEVICE EQUIPPED WITH SUCH A WING

Marc Amerigo et al.

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THICK WING FOR PROPULSION OR LIFT AND DEVICE EQUIPPED WITH SUCH A WING

[Aile épaisse de propulsion ou de sustentation et engin équipé d'une telle aile]

Inventors: Marc Amerigo et al.

Applicant: Law Association Voiltec - France

The present invention relates to the technical domain of thick wings in the general sense, /1* for propulsion or lift, intended for equipping wind-propelled devices.

The invention can be applied particularly advantageously for equipping devices such as a sail board, a boat, a sail cart, a speed-sail craft or a delta wing.

In the domain of wings for propulsion or lift, numerous improvements have been made for the purpose of increasing their aerodynamic characteristics. These developments relate to the nature of the materials constituting these wings as well as to their shape or general profile.

Thus, for example, in the domain of sail boards, the wing has a mast providing support for a sail equipped with reinforcing battens. The sail has a thin general profile suited to function in the various meteorological conditions and conditions of use of the sail board.

In the domain of boats, the most widely used sails are sails with a thin profile. In order to improve their performances, it has been proposed to equip the boats with a wing with a thick profile having a fixed mast with a determined profile, extended by an articulated flap making it

* [Numbers in the margin indicate pagination of the original foreign text.]

possible to change the shape and the aerodynamic characteristics of the wing thus formed as a function of the position of the boat with respect to the wind and the nature of the wind.

All the solutions proposed up to now do not enable one to obtain an optimized yield of the wing as a function of the aerodynamic conditions encountered. Furthermore, the use of wings with thin profiles leads to difficulty in suitably orienting the wing whose range of adjustment is relatively small. Consequently, such problems limit the speed possibilities of the devices equipped with the currently known wings.

The object of the invention aims to remedy the disadvantages set forth above by proposing a thick wing, suitable for allowing optimization of the aerodynamic characteristics of the wing.

To attain this objective, the wing according to the invention has a mast which supports /2
thick profiles connected together by an envelope defining an under surface and an upper surface between a leading edge and a trailing edge.

According to the invention, at least one of the thick profiles is equipped with means ensuring its pivoting around the mast, essentially starting from the leading edge to the trailing edge, and the envelope has a flexible or semi-rigid nature so as to allow a shift of position between the thick profiles for the purpose of obtaining twisting of the wing.

Various other characteristics emerge from the description given below in reference to the appended drawings which show, as non-limiting examples, some forms of execution and of implementation of the object of the invention.

Figure 1 is a diagrammatic view showing an execution example of a thick wing according to the invention used for a sail board.

Figure 2 is a view in cross section considered roughly according to lines II-II of Figure 1.

Figure 3 is a top view of the wing illustrated in Figure 1.

Figure 4 is a view in section illustrating another execution example of a wing according to the invention.

Figure 5 is a partial view in section showing another embodiment of thick profiles according to the invention.

Figure 6 is a view in section considered roughly according to lines VI-VI of Figure 5.

Figure 7 is a view in section of another execution variant of a wing according to the invention intended preferably for equipping a boat.

Figure 8 is a diagrammatic view showing the application of a wing according to the invention to a delta wing.

Figure 1 illustrates an execution example of propulsion wing 1 according to the invention designed for equipping floating device 2, for the purpose of forming together device 3 such as a sail board. As emerges more precisely from Figures 1 and 2, wing 1 has mast 4, preferably

circular in cross section, supporting a series of thick profiles 5 determining the general shape of the wing. According to the invention, at least one of the profiles, and in the example, each of /3
five thick profiles 5, is equipped with means 6 ensuring its pivoting around mast 4. In the execution variant illustrated, each thick profile 5 is delimited by two battens 7, 8 each borne by support 9 which is arranged so as to have, as pivoting means 6, contact or bearing surface 10 whose shape is essentially complementary to that of the mast and, for example, limited to a circular sector.

In the example illustrated, the two supports 9 of the battens forming thick profile 5 are placed at the same level of mast 4. In the case in which such a positioning is not possible, particularly when the mast has a small cross section, supports 9 belonging to the same thick profile 5 can be mounted in a superposed manner on mast 4. In a general way, each pair of battens 7, 8 defines a thick profile starting roughly from leading edge 11 of the wing, delimited by the end generating line of mast 4, to trailing edge 12 of the wing. Each batten 7, 8 is engaged in housing 13 arranged in support 9 and allowing the batten to abut against bearing surface 14 offered by support 9. Battens 7, 8 are intended for being attached to envelope 15 allowing thick profiles 5 to be joined together. Envelope 15 has a flexible or semi-rigid nature so as to allow a shift of angular position between the different thick profiles 5. Conventionally, each envelope 15 is produced from the assembling of various pieces of material forming a surface capable of receiving the action of the wind and propelling the sail board. Preferably, envelope 15 is provided with sleeves 16 each suitable for receiving batten 7 or 8.

According to the execution example illustrated in Figure 2, the end of batten 7, 8, opposite from that abutting against support 9, cooperates with fastening strap 17 allowing an adjustable force of compression to be applied to the batten for the purpose of giving it a predetermined shape. It should be noted that the application of the adjustable force of compression can be provided on the end of the batten engaged in support 9.

According to another execution example, battens 7, 8 are configured so as to have a determined profile chosen as a function of the desired aerodynamic characteristics. Preferably but not exclusively, each batten 7, 8 has a stiffness which is variable depending on its length. In /4
all cases, it must be considered that the compression force applied on battens 7, 8 is roughly identical so that the battens suitably define the desired profile.

The number of thick profiles 5 is determined as a function of the mechanical stresses in order to obtain a good mechanical strength of the wing. Thick profiles 5 according to the invention can be distributed from bottom to top of wing 1 or over a limited height of the wing whose remaining height has a fixed thick profile. Thick profiles 5 can have identical cross sections or, as illustrated, different cross sections depending on their level of positioning on the mast and the function that they are to fulfill. For example, thick profiles 5 placed in the low part

of wing 1 must generate great strength whereas thick profiles 5 of the upper part of the wing must as a priority limit the drag. The overall geometry of wing 1 is obtained by fixing of thick profiles 5 which is done by stretching the envelope.

Wing 1 thus formed offers the characteristic of being a semi-rigid thick wing, which allows it to be twisted, as emerges more precisely from Figure 3. Inasmuch as thick profiles 5 are articulated on mast 4, their position around the mast changes, so that their aerodynamic characteristics are always optimized. The twisting of wing 1 thus takes place starting from the point of articulation of thick profiles 5, essentially the leading edge 11 of the wing, to trailing edge 12 delimited by the leech of envelope 15.

In the example illustrated, the mounting of wing 1 is done in the following way. Envelope 15 is spread and is provided with battens 7, 8 engaged in sleeves 16 of the envelope and in their support 9. Mast 4 is placed in the middle of envelope 15 between supports 9 and is engaged in head 20 made on envelope 15. In a conventional manner, hoisting ropes 21, 22 at the top and the bottom of the mast are engaged respectively in lugs arranged on the upper part and the lower part of envelope 15 and in the top and bottom of the mast. Then, envelope 15 is folded so as to allow the positioning of boom 24 mounted in a conventional manner on mast 4 and attached by hoisting ropes 25 at the site of the leech of the under surface and of the upper surface of envelope 15. Wing 1 is stretched using hoisting ropes 21, 22, 25 and straps 17 for stretching battens 7, 8. /5

During the stretching of the wing, mast 4 bends and adopts the shape of envelope 15 over the length of at least one generating line. The different tensions applied make it possible to form a thick wing with a continuous profile delimited by the various thick profiles 5. Advantageously, the under surface and upper surface leeches of envelope 15 are left free with respect to one another, on one hand, in order to allow the water to flow more easily when water has entered between the under surface and upper surface of the envelope, and on the other hand, in order to ensure a high quality of air flow, since in operation, the under surface and upper surface leeches approach one another and stick together thanks to the distribution of the pressures on the wing. Of course, it is possible to envisage connecting the under surface and upper surface leeches of the wing using connection means at points, such as ropes or self-hooking parts.

Figure 4 illustrates another execution variant of wing 1 according to the invention, according to which thick profiles 5 delimited by battens 7, 8 are mounted articulated on mast 4 using means 6 consisting of swellings or sliders 30 produced on the under surface and upper surface of envelope 15 and which are intended for being engaged in longitudinal groove 31 made on mast 4. Preferably, grooves 31 are made symmetrically on the mast while having a C-shaped cross section allowing swellings 30 to be maintained inside of grooves 31.

Figures 5 and 6 illustrate another execution variant of a wing according to the invention in which each thick profile 5 is delimited by solid flange or plate 32 on which envelope 15 is attached by any suitable means. Plate 32 is fixed in position using pin 33, on fitting nose 34 of support 35. As emerges more precisely from Figure 6, support 35 has bearing surface 37 which is complementary, over a part at least, to the profile of mast 4. Support 35 can be maintained in position on mast 4 using clamps 38.

Figure 7 illustrates another execution variant of a wing according to the invention, which /6
is intended more particularly for equipping boats. Each thick profile 5 is delimited by solid flange 40 arranged so as to have part 41 for connecting with support 42 mounted inside of mast 4. Flanges 40 are connected together by the intermediary of envelope 15 of which the under surface and the upper surface both have swelling or sliders 30 intended for cooperating with groove 31 made on mast 4, as explained in Figure 4. Each support 42 is mounted at a given level of the mast in such a way that it can pivot over a angular range determined by opening 43 made in mast 4 in order to allow passage of connecting part 41 of the flange. Advantageously, supports 42 are rotated by motor components allowing automatic control of the position of thick profiles 5.

The under surface and the upper surface of envelope 15 are connected by their leech at least at points so that, by their sliding on the mast, envelope 15 can be hoisted up or down.

Wing 1 according to the invention thus makes it possible to equip any devices capable of being propelled by wind. However, as appears in Figure 8, wing 1 according to the invention can equip a lift device such as a delta wing having a mast or brace 4 supporting thick profiles 5 which joins the envelope 15 according to the invention. In this variant, it should be noted that the under surface and upper surface leeches must be joined.

The invention is not limited to the examples described and represented since various modifications can be made without leaving the scope of the invention.

Claims /7

1. A wing for propulsion or lift intended for equipping a device propelled or lifted by the wind, wing (1) having mast (4) supporting thick profiles (5) connected together by envelope (15) defining an under surface and an upper surface, between leading edge (11) and trailing edge (12),

characterized by the fact that at least one of thick profiles (5) is equipped with means (6) ensuring their pivoting around mast (4), essentially starting from the leading edge to the trailing edge, and by the fact that envelope (15) has a flexible or semi-rigid nature so as to allow a shift of position between thick profiles (5) for the purpose of obtaining twisting of the wing.

2. A wing according to Claim 1, characterized by the fact that each of thick profiles (5) has a non-deformable geometric shape.

3. A wing according to Claim 2, characterized by the fact that each of thick profiles (5) has solid flange (32, 40) articulated on the mast.

4. A wing according to Claim 1, characterized by the fact that each of thick profiles (5) has a deformable geometric shape.

5. A wing according to Claim 4, characterized by the fact that each thick profile (5) is delimited by two battens (7, 8) attached to envelope (15) and each mounted on support (9) mounted so as to pivot on mast (4).

6. A wing according to Claim 5, characterized by the fact that battens (7, 8) have a stiffness which is variable depending on their length.

7. A wing according to Claim 5, characterized by the fact that at least one end of each batten (7, 8) cooperates with means (17) for application of a force of compression making it possible to give the batten a predetermined shape.

8. A wing according to Claim 5, characterized by the fact that each batten (7, 8) is configured so as to have a predetermined profile.

9. A wing according to Claim 1 or 2, characterized by the fact that thick profiles (5) are controlled in terms of position of pivoting around the mast by means of motor components put in rotation.

10. A wing according to Claim 1, characterized by the fact that the upper surface and the under surface of envelope (15) at the site of the trailing edge are moreover connected together at points by connecting elements. /8

11. A device for lift or propulsion by the wind, characterized by the fact that it has at least one wing according to Claim 1.

FIG.1

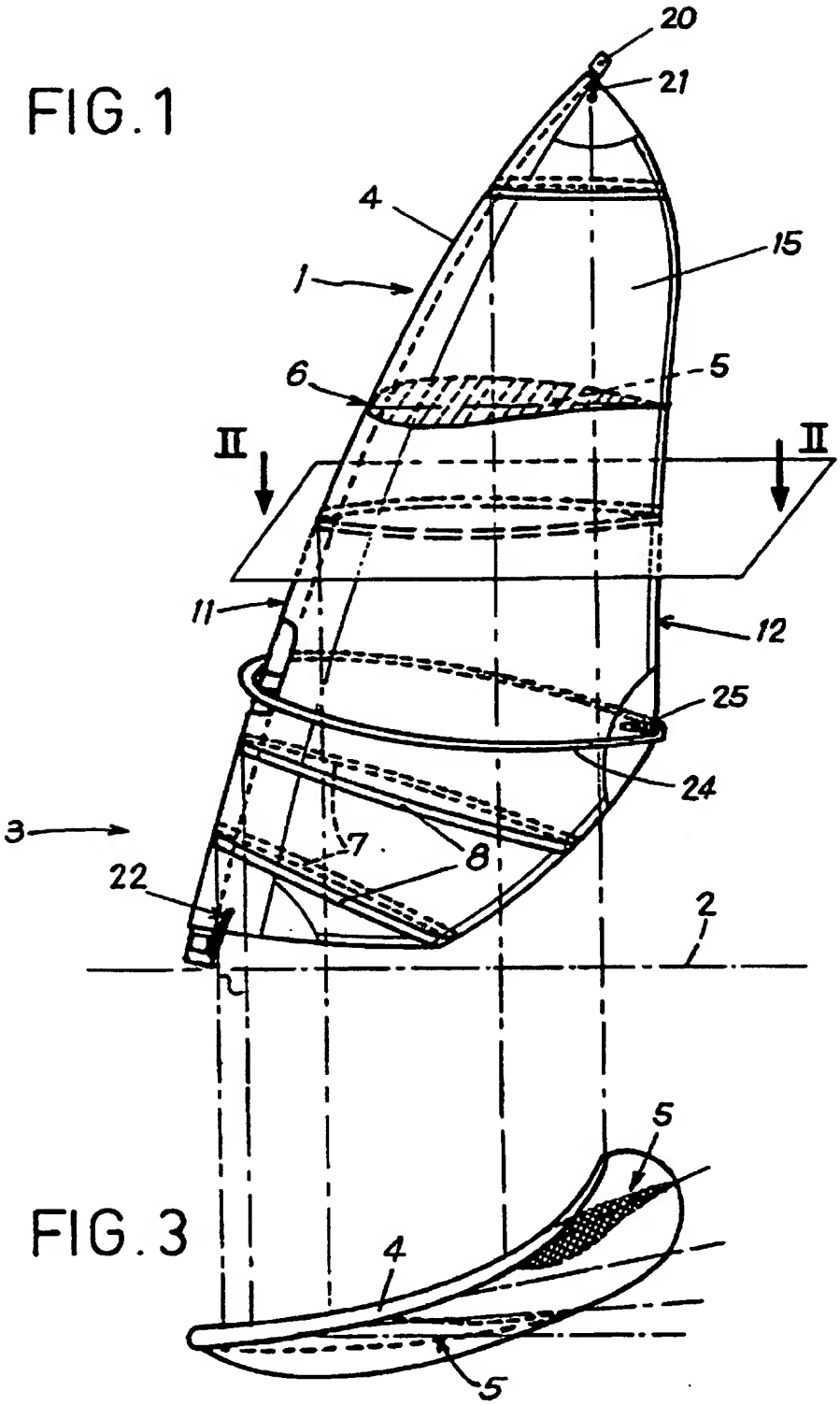


FIG.3

FIG. 2

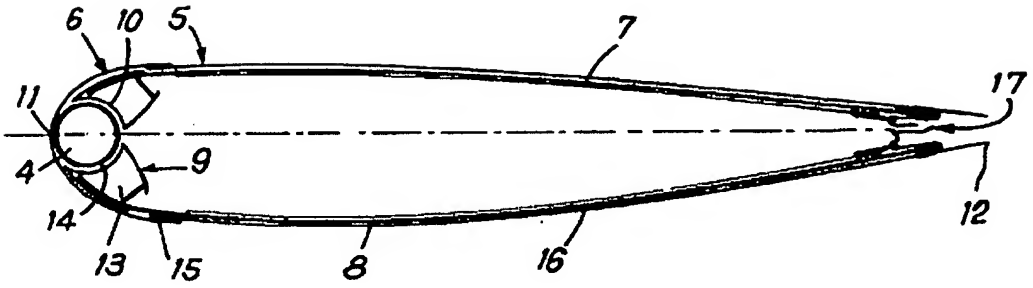


FIG. 4

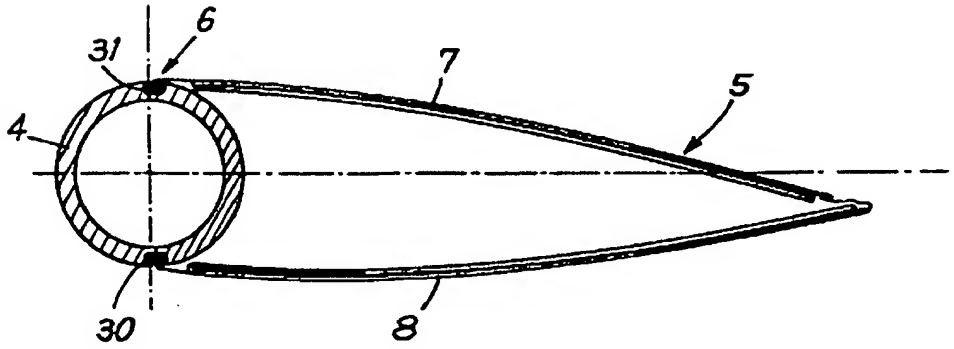


FIG.5

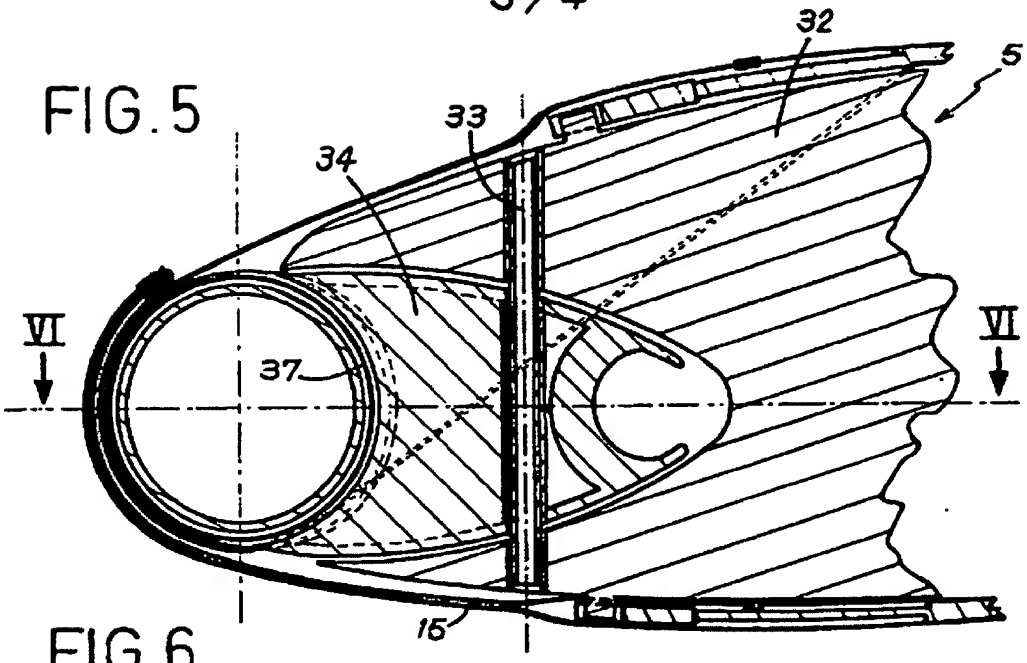


FIG.6

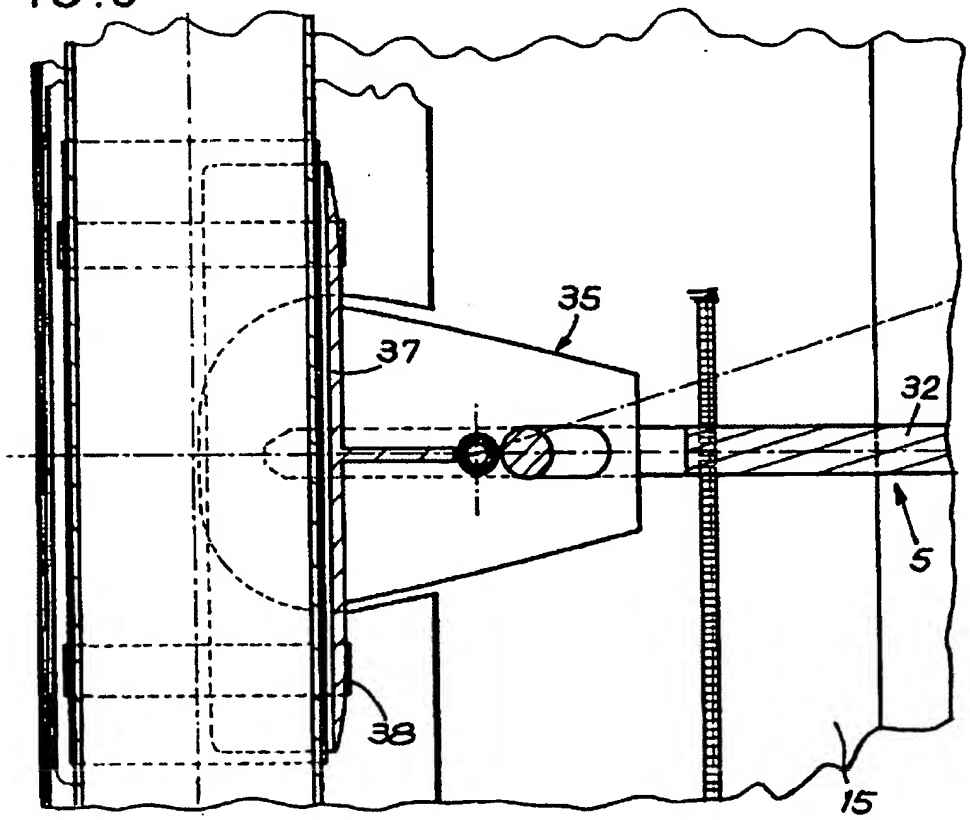


FIG.7

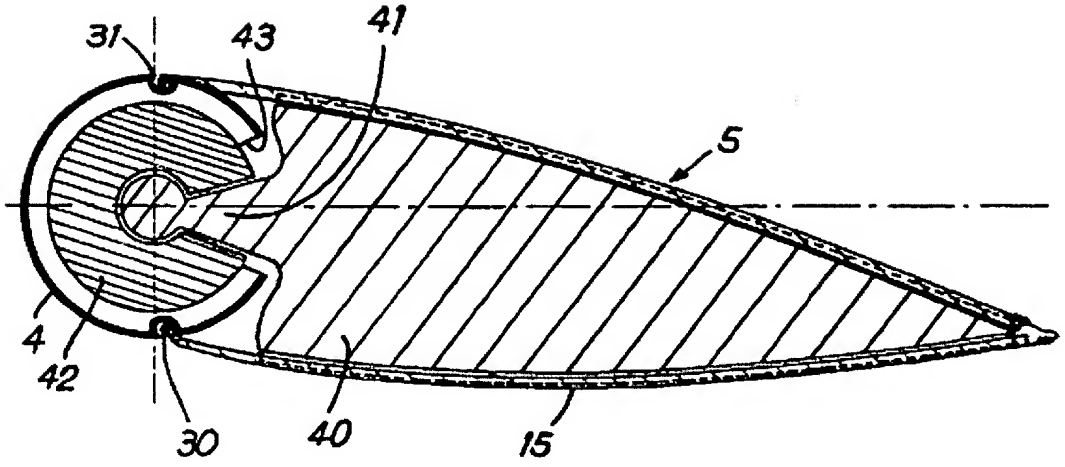
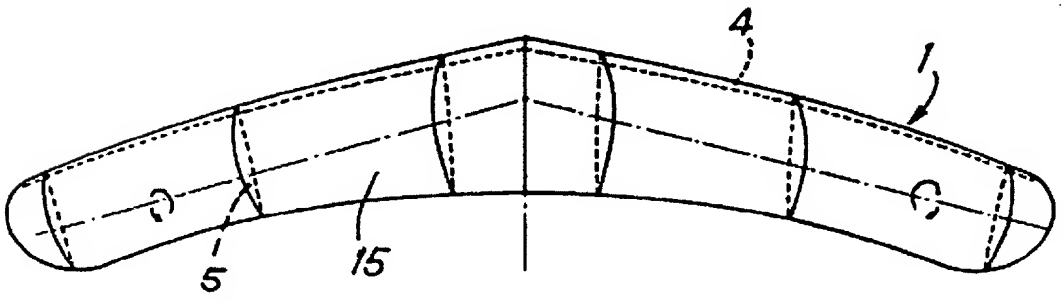


FIG.8



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SEARCH REPORT
established on the basis of the most recent
claims filed before the start of the search

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication where appropriate, of relevant passages	Claims concerned in the examined document	
X Y	EP-A-0 315 394 (T. DUKE) * abstract; figures * * column 2, line 33 – column 3, line 49 * ---	1,4,5 7-11 2,3,6	
Y	EP-A-0 392 848 (I. HOWLETT) * column 2, line 16 – line 38; figure 2* ---	2,3	
Y	EP-A-0 392 849 (I. HOWLETT) * abstract * ---	6	
X	DE-A-42 07 539 (E. WOLF) * column 3, line 62 – column 4, line 33; figures * ---	1,4,5, 7-11	TECHNICAL FIELDS SEARCHED (Int. Cl.[5]) B63H
A	US-A-4 064 821 (W. ROBERTS) * column 2, line 15 – column 3, line 68; figures * -----	1-11	
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